

Application No. 10/720,582

Reply to Office Action

*REMARKS/ARGUMENTS**The Pending Claims*

Claims 1-30 are currently pending. The pending claims are directed to fumed metal oxide particles and a process for producing the same.

Specification, Claim, and Drawing Amendments

Paragraph [0016] of the specification has been amended to correct a typographical error.

Claims 7-10 and 12 have been amended to more specifically point out the subject matter of the present invention. Support for the amendments may be found in the claims and specification as originally filed, for example, at paragraph [0011]. Claim 10 also has been revised to clarify its dependency on claim 8. Claim 25 has been amended to correct a typographical error.

The figure has been amended to delete the label "Fig. 1."

No new matter has been added to the application by way of these amendments.

Summary of the Office Action

The Office Action sets forth the following rejections:

(a) claims 1, 7-9, 13-18, 20, and 23-30 under 35 U.S.C. § 102(b) as allegedly anticipated by WO 90/10596,

(b) claims 1, 2, 6-9, 13-16, 18, 19, and 23-30 under 35 U.S.C. § 102(b) as allegedly anticipated by U.S. Patent 5,075,090 (Lewis et al.) ("the Lewis '090 patent"),

(c) claims 10-12 under 35 U.S.C. § 102(b) as allegedly anticipated by the Lewis '090 patent or, in the alternative, under 35 U.S.C. § 103(a) as allegedly obvious over the Lewis '090 patent,

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(d) claims 1-3, 7-10, 13, 14, 17, 18, 20, and 25-30 under 35 U.S.C. § 102(b) as allegedly anticipated by U.S. Patent 5,340,560 (Rohr et al.) ("the Rohr '560 patent"), and

(e) claims 1-6 and 13-24 under 35 U.S.C. § 102(e) as allegedly anticipated by U.S. Patent 6,887,566 (Hung et al.) ("the Hung '566 patent").

Applicants request reconsideration and withdrawal of these rejections for the reasons set forth below.

Discussion of the Anticipation Rejections

1. WO 90/10596

The Office Action rejects claims 1, 7-9, 13-18, 20, and 23-30 as allegedly anticipated by WO 90/10596. Applicants respectfully traverse this rejection.

The process for producing fumed metal oxides defined by rejected claims 1, 7-9, 13-18, 20, and 23-24 comprises providing a stream of liquid feedstock comprising a volatilizable non-halogenated metal oxide precursor, providing a stream of combustion gas having a linear velocity sufficient to atomize and combust or pyrolyze the liquid feedstock, and injecting the stream of the liquid feedstock into the stream of combustion gas to form a reaction mixture such that the liquid feedstock is atomized and subjected to a sufficient temperature and residence time in the combustion gas stream for fumed metal oxide particles to form before the combustion gas temperature is reduced below the solidifying temperature of the fumed metal oxide particle.

The Office Action alleges that WO 90/10596 discloses the production of a silica fume powder by oxidation of a silica precursor in a flame and combustion wherein the precursor along with an oxidant such as oxygen and supplemental methane or hydrogen are introduced into a burner via a nozzle and are combusted. However, WO 90/10596 discloses that the burner apparatus has a central orifice surrounded by multiple annular channels, wherein a *vaporized* silica precursor is introduced into the central orifice, while an oxidant stream and fuel stream are each supplied separately in their respective annular channels (page 8, lines 20-27). Therefore, the feedstock is in a vaporized form (i.e., not in liquid form) prior to coming into contact with a combustion gas. Accordingly, while WO 90/10596 discloses a process for

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producing fumed silica particles, WO 90/10596 does not disclose "injecting the stream of the liquid feedstock into the stream of combustion gas to form a reaction mixture such that the liquid feedstock is atomized," as recited in the pending process claims.

The composition defined by rejected claims 25-30 comprises about 2000 or more fumed silica aggregates having primary particle size d and an aggregated size D_{circ} , wherein the average of the primary particle sizes d_{ave} , the average of the aggregate sizes $D_{circ ave}$, and the geometric standard deviation of the aggregate sizes $\sigma_g(D_{circ})$ satisfy one or both of the following equations: (1) $D_{circ ave} \text{ (nm)} < 52 + 2 \times d_{ave} \text{ (nm)}$; (2) $\sigma_g(D_{circ}) < 1.44 + 0.011 \times d_{ave} \text{ (nm)}$.

The Office Action alleges that WO 90/10596 teaches the claimed process and inherently discloses the product that results from that process. Thus, the rejection of claims 25-30 based on WO 90/10596 is predicated on the assumption that WO 90/10596 discloses the claimed process. This assumption is not correct, as discussed above. Accordingly, it cannot be presumed that WO 90/10596 inherently discloses the product of rejected claims 25-30.

Since WO 90/10596 does not disclose the subject matter of any of the pending claims, the anticipation rejection based on WO 90/10596 is improper and should be withdrawn.

2. *Lewis '090 Patent*

The Office Action rejects claims 1, 2, 6-16, 18, 19, and 23-30 as allegedly anticipated by the Lewis '090 patent.

Claims 2, 6-16, 18, and 19 are directly or indirectly dependent on, and include all of the limitations of, claim 1, which is discussed above in connection with WO 90/10596.

The Office Action alleges that the Lewis '090 patent discloses a process for preparing metal oxide particles by introducing a precursor, which can be mixed with a carrier, into a combustion zone and combusting a gas to produce the metal oxide particles. However, the Lewis '090 patent discloses the separate introduction into a burner of both a precursor stream and a hexane stream, followed by atomization of the two mixed ingredients (col. 4, line 64 - col. 5, line 9). The Lewis '090 patent does not disclose that atomization of the liquid

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feedstock is effected by injection of the liquid feedstock (i.e., the precursor stream) into the stream of the combustion gas (i.e., the hexane stream). Accordingly, while the Lewis '090 patent discloses a process of preparing a metal oxide, the Lewis '090 patent does not disclose "injecting the stream of the liquid feedstock into the stream of combustion gas to form a reaction mixture *such that the liquid feedstock is atomized*," as recited in the pending process claims.

The Office Action also alleges that, since the Lewis '090 patent teaches the claimed process, it inherently discloses the product that results from that process and that is defined by rejected claims 25-30. Thus, the rejection of claims 25-30 based on the Lewis '090 patent is predicated on the assumption that the Lewis '090 patent discloses the claimed process. This assumption is not correct, as discussed above. Accordingly, it cannot be presumed that the Lewis '090 patent inherently discloses the product of rejected claims 25-30.

Since the Lewis '090 patent does not disclose the subject matter of any of the pending claims, the anticipation rejection based on the Lewis '090 patent is improper and should be withdrawn.

3. *The Rohr '560 Patent*

The Office Action rejects claims 1-3, 7-10, 13, 14, 17, 18, 20, and 25-30 as allegedly anticipated by the Rohr '560 patent.

Claims 1-3, 7-10, 13, 14, 17, 18, and 20 are directly or indirectly dependent on, and include all of the limitations of, claim 1, which is discussed above in connection with WO 90/10596.

The Office Action alleges that the Rohr '560 patent discloses a method of making fumed silica which includes feeding a silicon precursor material and oxygen and hydrogen into a combustion chamber. However, while the precursor material is in liquid form when it contacts the oxygen and hydrogen, the Rohr '560 patent does not disclose that the precursor material is atomized when it contacts the oxygen and hydrogen as opposed to remaining in liquid form as it is fed into the combustion chamber (col. 3, lines 29-45). Accordingly, while the Rohr '560 patent discloses a process of preparing fumed silica, the Rohr '560 patent does not disclose "injecting the stream of the liquid feedstock into the stream of combustion gas to

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form a reaction mixture *such that the liquid feedstock is atomized*,” as recited in the pending process claims.

The Office Action also alleges that, since the Rohr ‘560 patent discloses the claimed process, it inherently discloses the product that results from that process and that is defined by rejected claims 25-30. Thus, the rejection of claims 25-30 based on the Rohr ‘560 patent is predicated on the assumption that the Rohr ‘560 patent discloses the claimed process. This assumption is not correct, as discussed above. Accordingly, it cannot be presumed that the Rohr ‘560 patent inherently discloses the product of rejected claims 25-30.

Since the Rohr ‘560 patent does not disclose the subject matter of any of the pending claims, the anticipation rejection based on the Rohr ‘560 patent is improper and should be withdrawn.

4. *The Hung ‘566 Patent*

The Office Action rejects claims 1-6 and 13-24 as allegedly anticipated by the Hung ‘566 patent.

Claims 1-6 and 13-24 are directly or indirectly dependent on, and include all of the limitations of, claim 1, which is discussed above.

The Office Action alleges that the Hung ‘566 patent discloses the production of a metal oxide (specifically, cerium oxide) by atomizing a cerium oxide precursor and introducing the atomized cerium oxide precursor into a high temperature reaction zone, such as a flame resulting from a mix of fuel (such as hydrogen or methane) and oxidant (such as air or oxygen). The Office Action further alleges that the Hung ‘566 patent discloses that any of several well-known atomizing means can be used at various locations. However, while the Hung ‘566 patent discloses that the “cerium oxide precursor solution is aerosolized by any suitable means” (col. 3, lines 49-50), the Hung ‘566 patent discloses that, “[p]referably, the *aerosol* of the cerium oxide precursor solution is injected through the flame or into the hot gas stream located downstream of the flame” (col. 4, lines 2-4 (emphasis added); see also references to the aerosol of the cerium oxide precursor solution at col. 4, lines 4-7 and 47-50), as opposed to injecting the *liquid* feedstock into the stream of combustion gas, as recited in the pending process claims.

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Similarly, in Examples 1 and 3 of the Hung '566 patent, the cerium oxide precursor solution is atomized prior to contacting the stream of combustion gas (col. 7, lines 40-57, and col. 8, lines 8-26), while, in Example 2, the cerium oxide precursor is converted to an aerosol by action of both an air or fuel/nitrogen mixture and a burning fuel/air mixture in a gas atomization device such that the "aerosol of the cerium oxide precursor solution is directed through a flame" (col. 7, line 58 - col. 8, line 7). Moreover, while Example 4 refers to a cerium oxide precursor solution containing cerium acetate sesquihydrate and methanol as being introduced into "a high temperature, high shear environment ... through a liquid jet stream ... and ... atomized via the high shear in the venturi" (col. 8, lines 8-42), the cerium oxide precursor is not a *volatizable* metal oxide precursor, as recited in the pending process claims. In other words, the cerium oxide precursor is not "a compound that readily converts to a gas or vapor when introduced into the stream of combustion gas" (present specification at paragraph [0011]) but rather would decompose at sufficiently high temperature without being converted into a gas or vapor.

Accordingly, the Hung '566 patent does not disclose "providing a stream of a liquid feedstock comprising a *volatizable* non-halogenated metal oxide precursor" and "injecting the stream of the *liquid* feedstock into the stream of combustion gas to form a reaction mixture *such that the liquid feedstock is atomized*," as recited in the pending process claims.

Since the Hung '566 patent does not disclose the subject matter of any of the pending claims, the anticipation rejection based on the Hung '566 patent is improper and should be withdrawn.

Furthermore, the Hung '566 patent may not be used to show that the claimed subject matter is obvious. The Hung '566 patent qualifies as prior art only under 35 U.S.C. § 102(e), and the Hung '566 patent and the claimed invention were, at the time the claimed invention was made, owned by the same person or subject to an obligation of assignment to the same person, namely Cabot Corporation, as evidenced by the recorded assignments for the Hung '566 patent and the present application. As a result, the Hung '566 patent cannot be utilized as prior art under 35 U.S.C. § 103 against the claimed invention.

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Discussion of the Obviousness Rejection

The Office Action rejects claims 10-12 as allegedly obvious over the Lewis '090 patent.

Claims 10-12 are directly or indirectly dependent on, and include all of the limitations of, claim 1, which is discussed above with respect to the anticipation rejections.


The obviousness rejections are predicated on the assumption that the Lewis '090 patent discloses the process of claim 1. This assumption is not correct, as discussed above with respect to the anticipation rejections. Accordingly, the Lewis '090 patent cannot properly be considered to disclose or suggest the subject matter defined by claims 10-12.

In view of the foregoing, the subject matter defined by claims 10-12 cannot properly be considered obvious over the Lewis '090 patent, and Applicants respectfully request withdrawal of the obviousness rejection.

Conclusion

Applicants respectfully submit that the patent application is in good and proper form for allowance. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,



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